CLAIMS

We claim:

1. An article of manufacture useful in detection of neutron radiation, comprising a thin wall straw tube, said wall having a total areal density of less than 90 mg/cm^2 and having deposited on its inner surface a thin electrically conducting layer having a content of ^{10}B of at least 10 wt%, said layer having a total thickness between 0.12 mg/cm^2 and 0.48 mg/cm^2.

2. The article of claim 1 wherein the thin wall is composed of one or more layers of metal, plastic or metallic coated plastic film, each having a thickness between 5 μm and 75 μm, bonded together with suitable adhesive, wherein the choice of materials is optimized for a desired gamma radiation sensitivity.

3. The article of claim 2 wherein the straw wall is composed of layers of materials having minimal hydrogen content to minimize scattering of low energy thermal neutrons.

4. The article of claim 2 further employing walls of low Z, hydrogen free materials to minimize the sensitivity for gamma ray interactions.

5. The article of claim 2 wherein a layer or layers of the wall comprises a high Z material in order to enhance sensitivity to gamma rays.

6. The article of claim 1 wherein the wall layers comprises a composition having a Z near that of Fe, which composition produces an optimally linear count response in proportion to the physiological dose equivalent of radiation impinging on the straw.

7. The article of claim 1 in which a thin conducting wire is held at electrically stable tension at the center of the straw, utilizing electrically insulating end fitting means at each end of the straw, and in which when an electrical potential is applied a positive electrical potential upon the wire is produced relative to the straw wall.

8. The article of claim 7 in which signal detection means are connected to the central anode wire, for amplification and detection of charge signals produced in the wire.

9. The article of claim 8 in which charge signals arising from a threshold in the range 50-150 keV ionization deposition in a gas within the straw are discriminated from smaller signals and are counted as neutron events.

10. The article of claim 8 in which charge signals between 0.5 keV and 150 keV ionization deposition in the straw gas are detected and counted as gamma ray events.

11. The article of claim 8 in which charge signals between 0.5 keV to 150 keV and charge signals greater than 150 keV are simultaneously counted respectively as gamma events and neutron events.

12. An article of manufacture, comprising an array of closely packed straws of claim 7 with all wires connected together and employing a detection means for detection of events having charge delivery arising from ionization deposition in a gas within the straw above a threshold level between 50-150 keV.

13. An article of manufacture, comprising an array of closely packed straws of claim 7 with all wires connected together and employing a detection means for separate detection of events having charge delivery above a threshold level between 50-150 keV and events having charge delivery between 0.5-50 keV.

14. An article of manufacture, comprising

a small diameter straw tube having a thin layer of B_4C of a thickness of 0.5 to 2 μm on its interior surface.

15. An article of manufacture, comprising

a small diameter straw tube having a thin layer of B_4C of a thickness of 0.5 to 2 μm on its interior surface,

an end fitting means affixed in each end of said straw tube which is capable of receiving and positioning a wire centrally within said straw tube out of electrical

communication with said coating of B_4C and capable of allowing a flow of gas through said tube.

16. An end fitting means, comprising;

a twister element having a helical configuration which defines a central aperture;

a cylindrical envelope designed for receiving said twister element in a secure relationship;

said cylindrical envelope with said twister element secured therein being passable of a gas when said end fitting means is installed within a straw tube body.

17. An article of manufacture, comprising

a small diameter straw tube having a thin layer of B_4C of a thickness of 0.5 to 2 μm on its interior surface,

an end fitting means affixed in each end of said straw tube which is capable of receiving and positioning a wire centrally within said straw tube out of electrical communication with said coating of B_4C and capable of allowing a flow of gas through said tube, and

a wire positioned centrally within said straw tube out of electrical communication with said coating of B_4C.

18. An article of manufacture, comprising

a close packed array of a plurality of small diameter straw tubes, each of said tubes having

a thin layer of B_4C of a thickness of 0.5 to 2 μm on its interior surface,

an end fitting means affixed in each end of said straw tube which is capable of receiving and positioning a wire centrally within said straw tube out of electrical communication with said coating of B_4C and capable of allowing a flow of gas through said tube, and

a wire positioned centrally within said straw tube out of electrical communication with said coating of B_4C,

array end fitting means for receiving said close packed array of a plurality of small diameter straw tubes and separately electrically connecting said B_4C coating and said centrally positioned wire of each tube to circuit

means by which it may be determined which of said plurality of small diameter straw tubes has experienced a neutron capture event, said array end fitting means also providing means for allowing passage of a gas into said plurality of small diameter straw tubes.

19. The article of claim 18, wherein said B_4C is enriched in its content of ^{10}B beyond the natural abundance of ^{10}B content in elemental B.

20. The article of claim 18, wherein said straw tube has a length at least 25 times greater than its diameter.

21. The article of claim 18, wherein said straw tube has a diameter of 4 mm or less.